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10/629,066	07/28/2003	Gregory S. Herman	200209441-1	5837

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EXAMINER	
PARSONS, THOMAS H	
ART UNIT	PAPER NUMBER
1745	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/629,066	HERMAN ET AL.	
	Examiner	Art Unit	
	Thomas H. Parsons	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 February 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *27-32,34,36-38 and 40-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27-32, 34, 36-38, 40-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Amendment

This is in response to the Amendment filed 13 February 2007.

(Previous) Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 27-31and 34 **stand** rejected under 35 U.S.C. 102(e) as being anticipated by Edlund et al. (2002/0114984).

Claim 27: Edlund et al. in Figures 5, 6, 10 and 11 disclose a fuel cell system (10), comprising:

a fuel cell stack (22) producing an anode effluent stream;

a hydrogen generation unit (12) configured to produce a hydrogen gas stream from an anode effluent stream. See paragraphs [0016]-[0047] and [0058]-[0061];

(Edlund et al. disclose in paragraph [0040] that the anode effluent (purge stream 84) may contain hydrogen gas. Alternatively, the hydrogen gas may be continuously vented from the anode region of the fuel cell stack and recirculated. And, in paragraph [0041], Edlund et al. disclose a combustion fuel stream 95 is schematically illustrated in FIG. 5. It should be understood that stream 95 may be formed from any suitable combustion fuel and may include

some or all of one or more of the following: byproduct stream 40 from fuel processor 12, feed stream 16, or a slipstream of a component thereof, such as a stream containing carbon-containing feedstock 18, stored hydrogen gas from hydrogen storage system 58, vented gas from product hydrogen streams 14, 54, 56, 64 or 66, a fuel stream independent of the feed stream 16 or the byproduct streams from system 10, such as a supply of a suitable fuel... Accordingly, this anticipates a hydrogen generation unit (12) configured to produce a hydrogen gas stream from an anode effluent stream or any other hydrogen stream. Further, in paragraph [0040] feed stream 16 may be delivered to fuel processor 12 via any suitable mechanism. Although only a single feed stream 16 is shown in FIG. 1, it should be understood that more than one stream 16 may be used and that these streams may contain the same or different components. When carbon-containing feedstock 18 is miscible with water, the feedstock is typically delivered with the water component of feed stream 16, such as shown in FIG. 1. When the carbon-containing feedstock is immiscible or only slightly miscible with water, these components are typically delivered to fuel processor 12 in separate streams, such as shown in FIG. 2.

Accordingly, Edlund et al. anticipate a hydrogen generation unit (12) configured to produce a hydrogen gas stream from an anode effluent stream or any other hydrogen stream);

a hydrogen storage unit (60) into which a portion of the produced hydrogen gas stream is stored; and

a structure (i.e. hybride beds) coupled to the hydrogen storage unit. In particular, Edlund et al. in paragraph [0034] disclose metal hybride beds (which is the same as that instantly disclosed) as an example of a hydrogen storage device in which the metal hybride bed absorbs hydrogen gas at relatively low pressures and temperatures, and then desorbs the gas *at elevated*

temperatures and temperatures. This disclosure has been construed as anticipating the claimed structure.

Further, the recitation ***that heats said fuel cell by promoting an exothermic reaction using the hydrogen from the hydrogen storage unit*** has been considered, and construed as a functional limitation that adds no additional structure to the fuel cell system. However, because the structural relationship between the hydrogen storage unit and the fuel cell stack are the same as that instantly claimed, and the reaction within the hydrogen storage unit is exothermic, the fuel cell system of Edlund et al. is capable of providing heat for fuel cell startup. Further, as to whether the heat is provided to the fuel cell stack for fuel cell start up is dependent upon the manner in which the fuel cell is to be operated.

Claim 28: Edlund et al. disclose that the hydrogen storage unit (60) comprises one or more mechanisms selected from the group consisting of metal hydride bed, hydrogen sorption material, and compressed gas bottle (paragraph [0033]).

Claim 29: Edlund et al. disclose that the hydrogen storage unit (60) comprises a metal hydride (paragraph [0033]).

Claim 30: Edlund et al. in Figure 3 disclose that the hydrogen generation unit (30) comprises a hydrogen separation membrane (44) (paragraph [0026]).

Claim 31: Edlund et al. in Figure 7 discloses a temperature control unit. More particularly, Edlund et al. disclose one or more sensors (124) to measure or detect selected values, or operating parameters, such as temperature via a temperature sensor. The sensors communicate with a processor (122) via a communication linkage (126). The processor further communicates with a controlled device (128) (paragraphs [0048]-[0050]).

Claim 34: Edlund et al. disclose a hydrogen means for providing additional power during high load on the fuel cell stack (paragraphs [0036], and [0059]-[0061]).

Claim Rejections - 35 USC § 103

4. The rejections of claims 36-38, 40 and 43 under 35 U.S.C. 103(a) as being unpatentable over Edlund et al. have been **withdrawn** in view of Applicants' Amendment.

5. Claim 32 **stands** rejected under 35 U.S.C. 103(a) as being unpatentable over Edlund et al. as applied to claim 27 above, and further in view of LaPierre et al. (6,348,278).

Edlund et al. are as applied, argued, and disclosed above, and incorporated herein.

Claim 32: Edlund et al. do not disclose that the temperature control unit is a heat exchanger.

LaPierre et al. in Figures 1 and 2 disclose a heat exchanger (66) (col. 13: 65-col. 14: 18). More particularly, La Pierre et al. disclose that a purified hydrogen stream exiting a hydrogen separating membrane is directed into a heat exchanger to cool the hydrogen to a temperature compatible with the fuel cell.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the apparatus of Edlund et al. by incorporating the heat exchanger of LaPierre et al. because both are concerned with feeding a reformate stream (purified hydrogen stream) to a fuel cell, wherein the reformate has passed through a separating membrane, and further LaPierre et al. disclose a heat exchanger that would have cooled the

hydrogen to a temperature that is compatible with the operation of the fuel cell thereby improving the overall performance of the fuel cell system.

5. The rejection of claim 41 under 35 U.S.C. 103(a) as being unpatentable over Edlund et al. as applied to claim 36 above, and further in view of LaPierre et al. (6,348,278) has been withdrawn in view of Applicants' Amendment.

(NEW) Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 36-38, 40 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edlund et al. in view of Keating, Jr., et al. (3,539, 397).

Claim 36: Edlund et al. in Figures 5, 6, 10 and 11 disclose a fuel cell system (10), comprising:

a fuel cell stack (22);

a means (12)(paragraphs [0024]-[0025]) for obtaining hydrogen from an anode effluent stream. See paragraphs [0016]-[0047] and [0058]-[0061];

Edlund et al. in paragraph [0040] disclose that the anode effluent (purge stream 84) which may contain hydrogen gas. Alternatively, the hydrogen gas may be continuously vented

from the anode region of the fuel cell stack and recirculated. And, in paragraph [0041], Edlund et al. disclose a combustion fuel stream 95 is schematically illustrated in FIG. 5. It should be understood that stream 95 may be formed from any suitable combustion fuel and may include some or all of one or more of the following: byproduct stream 40 from fuel processor 12, feed stream 16, or a slipstream of a component thereof, such as a stream containing carbon-containing feedstock 18, stored hydrogen gas from hydrogen storage system 58, vented gas from product hydrogen streams 14, 54, 56, 64 or 66, a fuel stream independent of the feed stream 16 or the byproduct streams from system 10, such as a supply of a suitable fuel... Accordingly, this anticipates a hydrogen generation unit (12) configured to produce a hydrogen gas stream from an anode effluent stream or any other hydrogen stream. Further, in paragraph Feed stream 16 may be delivered to fuel processor 12 via any suitable mechanism. Although only a single feed stream 16 is shown in FIG. 1, it should be understood that more than one stream 16 may be used and that these streams may contain the same or different components. When carbon-containing feedstock 18 is miscible with water, the feedstock is typically delivered with the water component of feed stream 16, such as shown in FIG. 1. When the carbon-containing feedstock is immiscible or only slightly miscible with water, these components are typically delivered to fuel processor 12 in separate streams, such as shown in FIG. 2.

Accordingly, Edlund et al. anticipate a hydrogen generation unit (12) configured to produce a hydrogen gas stream from an anode effluent stream or any other hydrogen stream); and,

a means for storing hydrogen (60) (paragraph [0033]).

Edlund et al. does not disclose a means for heating the fuel cell stack and for speeding up fuel cell startup.

Keating, Jr., et al. disclose in Figure 1 a means (start-up heater 60) for heating the fuel cell stack and for speeding up fuel cell startup (col. 3: 47-col. 4: 31).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the fuel cell stack of Edlund et al. by incorporating the startup heater of Keating, Jr., et al. because Keating Jr., et al. disclose a means (start-up heater 60) for heating the fuel cell stack and for speeding up fuel cell startup that would have provided improved control over the temperature at which the process in a fuel cell is carried out thereby improving the overall performance of the fuel cell.

Claim 37: The rejection of claim 37 is as set forth above in claim 29.

Claim 38: The rejection of claim 38 is as set forth above in claim 30.

Claim 40: The rejection of claim 40 is as set forth above in claim 31.

Claim 43: The rejection of claim 43 is as set forth above in claim 34.

6. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Edlund et al. in view of Keating, Jr., et al. as applied to claim 36 above, and further in view of LaPierre et al. (6,348,278).

Edlund et al. and Keating are as applied, argued, and disclosed above, and incorporated herein.

Claim 41: The Edlund et al. combination does not disclose that the temperature control unit is a heat exchanger.

LaPierre et al. in Figures 1 and 2 disclose a heat exchanger (66) (col. 13: 65-col. 14: 18). More particularly, La Pierre et al. disclose that a purified hydrogen stream exiting a hydrogen separating membrane is directed into a heat exchanger to cool the hydrogen to a temperature compatible with the fuel cell.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the apparatus of the Edlund et al. combination by incorporating the heat exchanger of LaPierre et al. because both are concerned with feeding a reformate stream (purified hydrogen stream) to a fuel cell, wherein the reformate has passed through a separating membrane, and further LaPierre et al. disclose a heat exchanger that would have cooled the hydrogen to a temperature that is compatible with the operation of the fuel cell thereby improving the overall performance of the fuel cell system.

Response to Arguments

4. Applicant's arguments filed 13 February have been fully considered but they are not persuasive.

The Applicants argue "Claim 27 requires a structure that that "heats said fuel cell stack by promoting an exothermic reaction using hydrogen from said hydrogen storage unit." The Examiner noted that Edlund discloses metal hydride beds that desorb the gas at elevated temperatures. Edlund, however, does not teach or even suggest using heat to heat the fuel cell stack. Further, Edlund does not teach or suggest using heat generated from an exothermic reaction involving hydrogen to heat the fuel cell stack. Edlund is directed to proton exchange membrane (PEM) and alkaline types of fuel cells. Para. [0023]. Unlike solid oxide fuel cells, the

types of fuel cells disclosed in Edlund need not be substantially heated for the fuel cell to operate. Accordingly, Edlund does not disclose a mechanism or even a desire to heat fuel cells during a start up process. Thus, although Edlund refers to metal hydride beds, Edlund does not teach or suggesting a metal hydride bed to generate heat for heating the fuel cell stack."

In response, Edlund et al. in paragraph [0034] disclose metal hybride beds (which is the same as that instantly disclosed) as an example of a hydrogen storage device in which the metal hybride bed absorbs hydrogen gas at relatively low pressures and temperatures, and then desorbs the gas *at elevated temperatures and temperatures*. This disclosure has been construed as anticipating the claimed structure.

Further, the recitation ***that heats said fuel cell by promoting an exothermic reaction using the hydrogen from the hydrogen storage unit*** has been considered, and construed as a functional limitation that adds no additional structure to the fuel cell system. However, because the structural relationship between the hydrogen storage unit and the fuel cell stack are the same as that instantly claimed, and the reaction within the hydrogen storage unit is exothermic, the fuel cell system of Edlund et al. is capable of providing heat for fuel cell startup. Further, as to whether the heat is provided to the fuel cell stack for fuel cell start up is dependent upon the manner in which the fuel cell is to be operated.

5. Applicant's arguments with respect to claim 36 (see Remarks, page 9last paragraph through page 9, line 7) have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas H. Parsons whose telephone number is (571) 272-1290. The examiner can normally be reached on M-F (7:00-4:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thomas H Parsons
Examiner
Art Unit 1745

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MARK RUTHKOSKY
PRIMARY EXAMINER

3.27.07